Servicing the

COMPUR - RAPID SHUTTER

DISASSEMBLY OF THE RIM-SET COMPUR–RAPID SHUTTER

The nameplate of the Compur-Rapid shutter is a bayonet-type with three lugs engaging a groove on the outside of the lens barrel. Rotation is prevented by a semi-circular cam turned to nest in a half-moon cutout at 12 o'clock on the outside of the lens barrel, Fig 67. By rotating the cam 180° so that the semi-circular section points to the outside of the shutter, Fig 68, it is possible to turn the nameplate in a counterclockwise direction. When the

lugs on the nameplate are aligned with relief clearances on the outside of the lens barrel the plate may be lifted as shown in Fig 69.

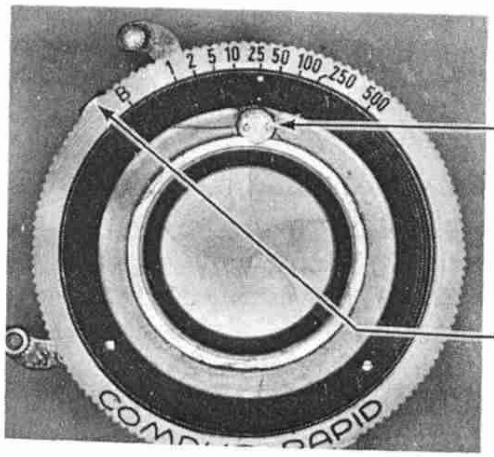


Figure 67

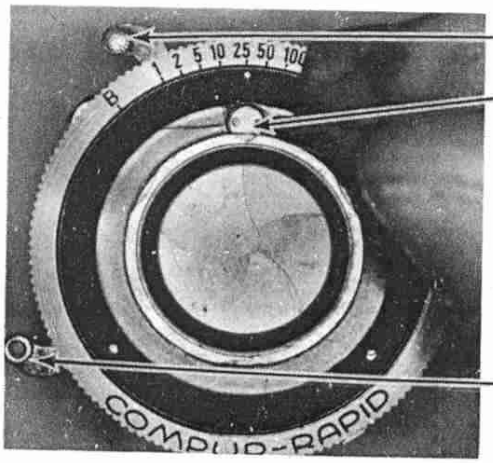


Figure 68

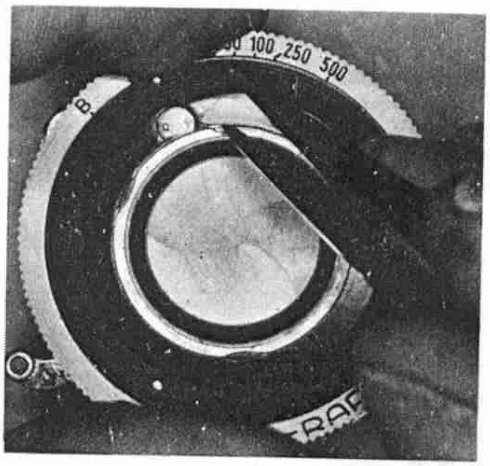


Figure 69

On some models the semi-circular locking cam may be covered by an additional plate (usually containing the name of the camera manufacturer using the shutter) which is held in place by two screws. Removal of one screw and loosening of the second will permit the plate to be swung out of the way revealing the locking cam.

On other models, usually in the larger sizes, and older versions, the locking cam is not used. Instead, a screw which passes through the nameplate into the mechanism prevents the plate from turning. This locking screw (at approximately 5 o'clock) is usually covered by a diaphragm calibration scale fastened on the bottom half of the nameplate by two screws. Partial removal of the scale will reveal the locking screw.

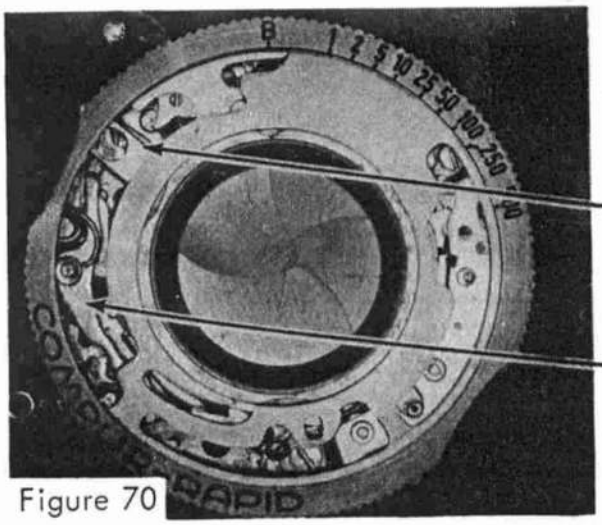


Figure 70

Be careful to avoid disturbing the speed cam when lifting off the nameplate. Many of the functioning parts of the shutter can be observed through the openings in the speed cam. Rotate the speed cam clockwise as far as it will go, holding it down firmly, Fig 70.

Note: The following description of bulb lever operation applies to the Compur and Compur-Rapid shutters with set-and-release bulb action. On

Compur models with automatic T and B action refer to the section "VARIATIONS IN THE COMPUR RIM-SET SHUTTER - Automatic Time and Bulb Action".

Setting and releasing the shutter will now give bulb operation. Find the long lever which extends from the release lever up to the cable release socket at approximately 10 o'clock. This is the cable release lever. Primarily, it provides a linkage between the cable release socket and the release lever to permit releasing of the shutter with a cable release. The cable release lever is spring tensioned and in constant engagement with the release lever, and so controls the action of the release lever which has no spring of its own. A secondary, but important function of the cable release lever is its control over the action of the bulb lever. Using the first finger of your right hand, set the shutter and then allow the setting lever to return slowly after releasing the shutter with the other hand. Observe how the cable release lever governs the bulb lever action via the lug on the right end of the bulb lever, Fig 71, which comes under, then up against the cable release lever. When the release lever is depressed, the cable release socket end of the cable release lever moves towards the center of the shutter, allowing the bulb lever to move into engagement with the main lever

Cable Release Lever Controls Bulb Lever Movement at This Point.

Note:
"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

Figure 71

for bulb action. When the lever system is allowed to return, the cable release lever picks up the bulb lever, moving it out of engagement with the main lever to complete the cycle.

Some Compur-Rapid models will not contain a cable release socket, yet retain the cable re-

lease lever. And other models, both with and without cable release sockets will use a bulb and cable release lever of slightly different design from the one previously discussed. However, the differences are minor and you should have no difficulty in analyzing the operation.

The setting lever is but an extension of the main lever, which is a full ring circling the lens barrel under the speed cam. Direct your attention to the area of the main lever where the setting lever passes under the speed cam. Directly underneath and assembled to the main lever is the cam follower lever, Fig 72. This is the part of the main lever assembly which operates the leaf lever. With the speed cam still set on bulb, slowly cock the shutter. Discover the bell crank-shaped lever between the cam follower and the cable release lever, Fig 73. This is the leaf lever. Reach through the

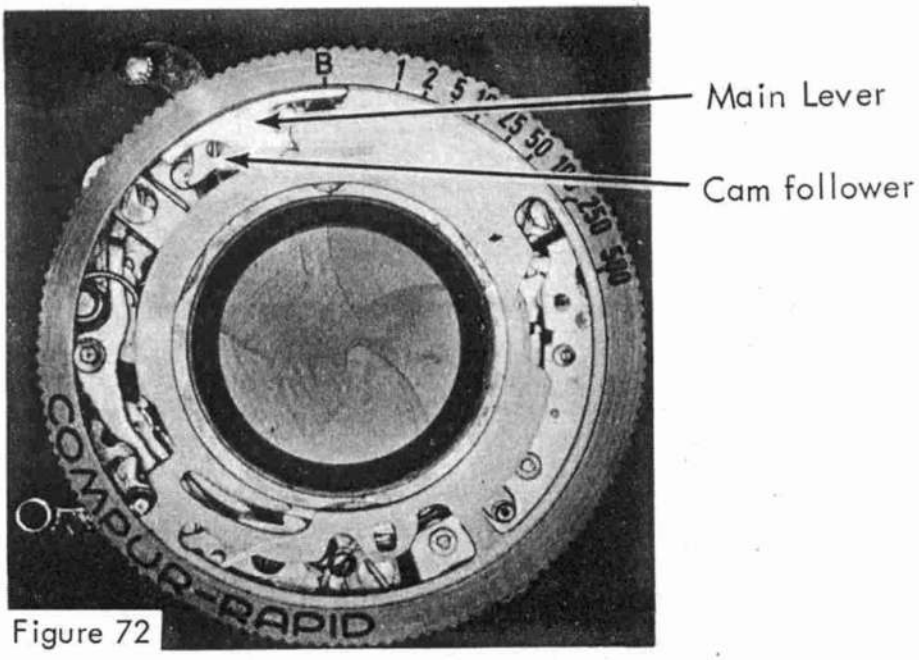
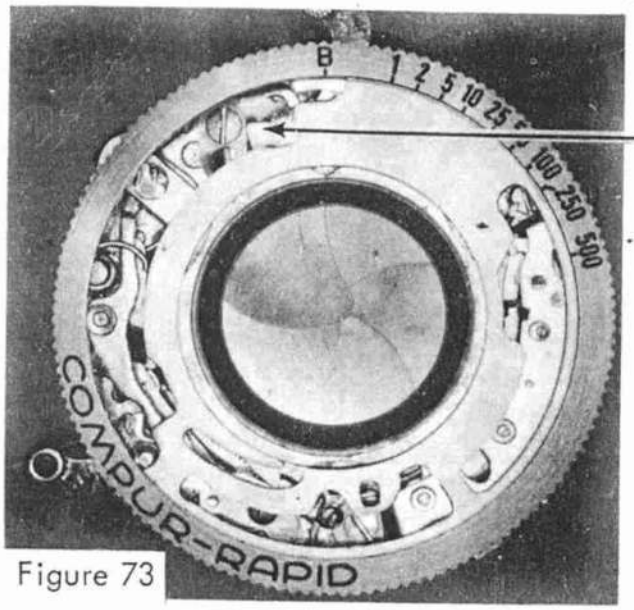


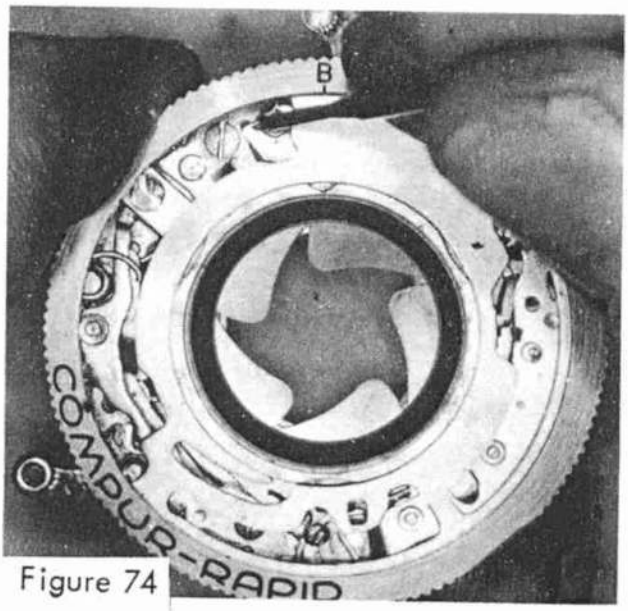
Figure 72

speed cam with a small screwdriver or pick and gently move the leaf lever in a counterclockwise direction, opening the blades, Fig 74. The leaf lever spring will return the blades to the closed position when the tool is removed. Restrain the setting lever and release the shutter. Allowing the setting lever to return slowly will help you to see how the cam follower operates the leaf lever.



Leaf Lever

Figure 73



Shutter Blades Partially Opened Via Movement of Leaf Lever

Figure 74

Use the nameplate locking cam cutout on the lens barrel as a reference point. Move the speed cam to the one-second setting, Fig 75. Now set and release the shutter several times. The lever at 4 o'clock which moves back and forth when the shutter is set and released is the retard lever, Fig 75. The retard section extends from just below this point up to approximately 2 o'clock. Restrain the movement of the setting (main) lever when the shutter is released so you can see how the retard lever is pushed back after the blades fully open.

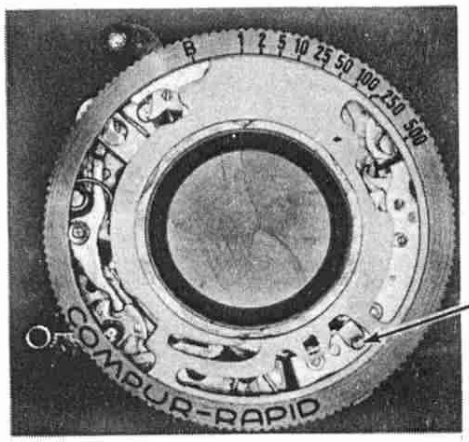


Figure 75

At the other end of the retard section is a lever which contacts both the main lever and the speed cam through a curved projection. This is the pallet lever, Fig 76. With the shutter in the released (rest) position, it is possible to move the pallet lever towards the outside of the shutter with a small screwdriver, Fig 77. When the pallet lever is pushed toward the outside of the housing, the

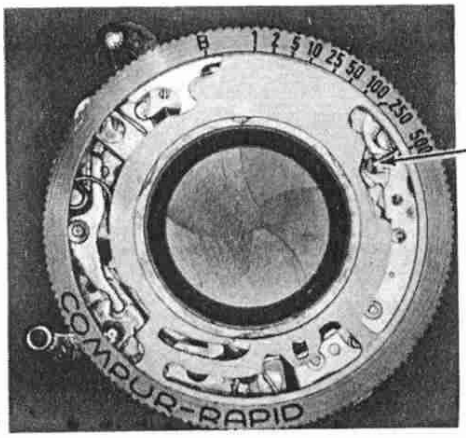


Figure 76

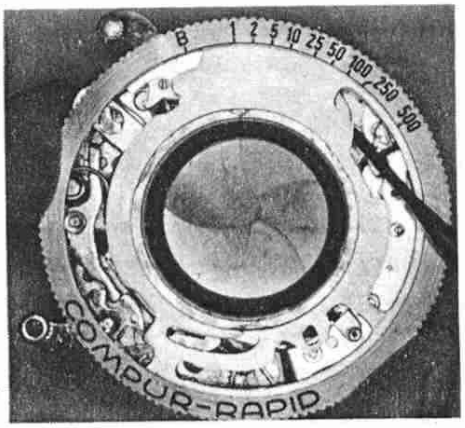
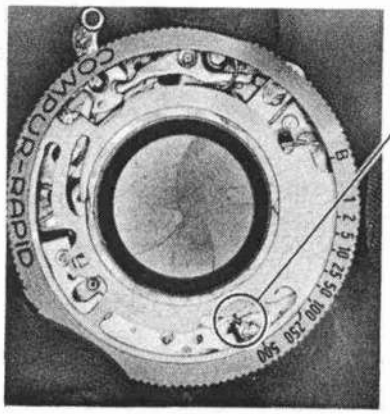


Figure 77

rapid007

pallet is disengaged from the star wheel. During the actual setting of the shutter, a cam-like section of the main lever pushes the pallet out of engagement, Fig 78, so the retard lever may move easily to its set, or ready, position. The reason for disengaging the pallet during the setting stroke becomes apparent when you operate a shutter that does not disengage the pallet during the setting stroke. (Some models of the Flash Supermatic are good examples.) When setting shutters of this type, the entire escapement is in operation as the retard lever moves to its ready position. Since the only power available to move the retard section to the ready position is provided by the tension of a relatively weak retard lever spring, the action is quite slow. In fact, if the shutter is set rapidly, the retard lever may be still moving into position 2 or 3 seconds after the shutter has been set. In shutters designed to disengage the pallet during the setting stroke, the tension of the retard lever spring need only overcome the inertia of the gear train, and the retard lever will move into position as the setting lever stroke is completed. When the shutter is released with the setting lever restrained, you can see the pallet lever move towards the center of the shutter, engaging the pallet as the main lever contacts the retard lever, Fig 79.



Cam-like Portion of Main Lever Pushing Pallet Lever towards Outside of Shutter Housing During Setting Stroke.

Note:
"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

Figure 78

Shutter in Partially Released Position with Shutter Blades Wide Open. Pallet Engaged and Main Lever Just Coming into Contact with Retard Lever.

Note:
"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

Figure 79

At the one-second setting the retard lever moves into a deep valley cut in the speed cam. As the speed cam is rotated to the 1/2 second position the retard lever cannot move as far, which means a shorter exposure with less retard gear train movement. Similar control has been seen in other shutters, and you will find that the movement of the retard decreases as the speed cam is rotated, one speed setting at a time, from 1 second to 1/10 second. At 1/10 second there is a minimum movement of the retard lever, Fig 80, but full pallet engagement takes place when the shutter is released.

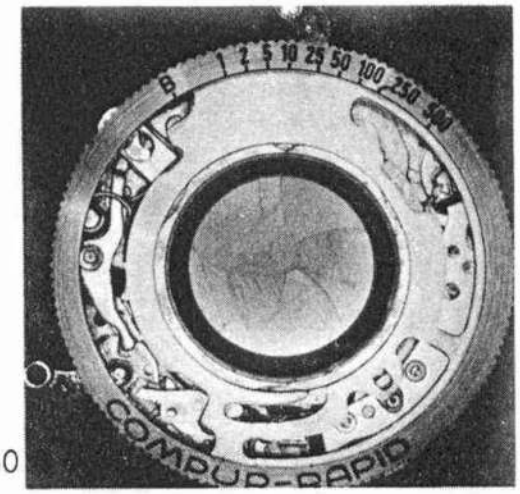


Figure 80

Speed Cam
Set at 1/10 sec.

Moving the speed cam one more setting, to 1/25 second, brings a new valley into position to receive the retard lever. But now, a projection on the speed cam has contacted the pallet lever holding it toward the outside of the shutter, Fig 81. Trip the shutter a few times at this setting and you will see that, although the retard lever has a large relative movement, exposure duration is compara-

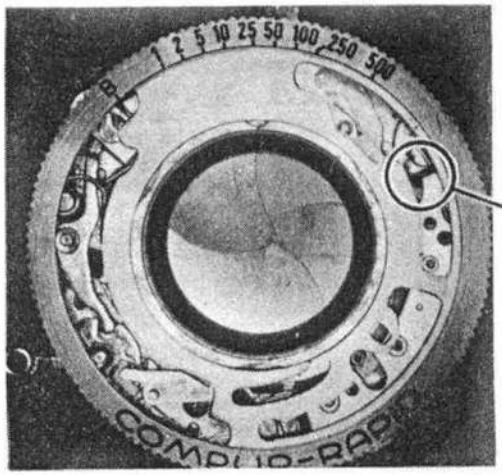


Figure 81

Speed Cam Set
at 1/25 sec.

Pallet Lever Held
Out of Engagement

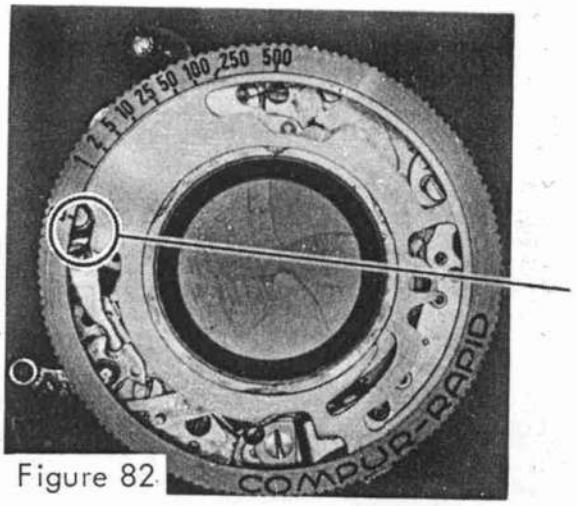
tively brief because only the inertia of the gear train retards the movement of the main lever (the pallet is completely disengaged). Further rotation of the speed cam decreases the movement of the retard lever by increments until, at the next-to-highest speed setting (1/250 second or 1/100 second on some models) there is no movement of the retard lever, no retard action on the main lever, and the shutter is operating as fast as possible under the tension of the main lever spring.

Movement of the speed cam to the highest speed setting permits the engagement of the free end of the high-speed spring (between 10 and 11 o'clock) with a milled section of the speed cam, Fig 82.

> Note: NEVER move the speed cam to the highest speed setting with the shutter in the set (cocked) position.

The lower end of the high-speed spring is engaged with a lug on the main lever. Setting of the shutter will now put two springs under tension. In addition to that of the main spring, there is the pressure of the high-speed spring, which is held in tension by the speed cam. With both springs under tension, the speed at which the main lever travels is doubled when the shutter is released.

Set the speed cam at 1/50 second to easily observe the action of the inner release lever. Cock the shutter slowly and watch the lever under the speed cam at 7 o'clock, Fig 83. This lever, which employs a seesaw motion during the setting of the shutter, is the inner release lever and engages a notch on the main lever when the shutter reaches its full set position. Moving the outer release



Speed Cam Set at 1/500 sec.

High-Speed Spring Engaged by Speed Cam

Figure 82

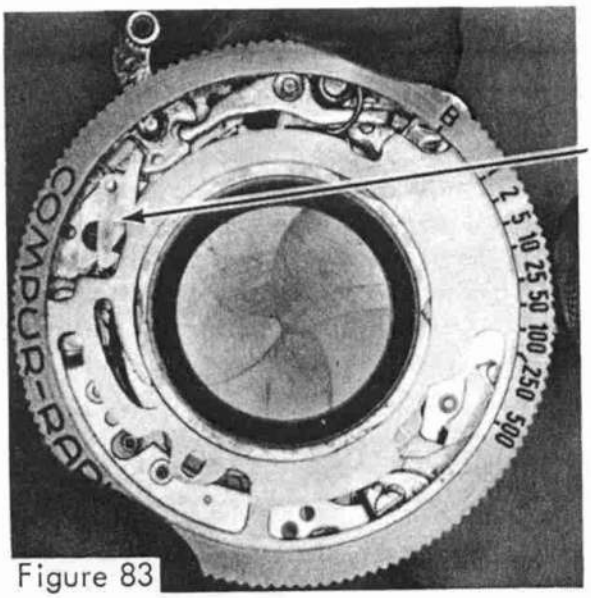


Figure 83

Note:

"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

lever in turn disengages the inner release lever from that notch permitting the main lever to return to its rest position. With the shutter in the released position, a depression in the surface of the main lever allows the latching end of the inner release lever to move towards the center of the shutter. This brings the other end of the inner release lever into such a position as to restrict the movement of the outer release lever, Fig 84. When the shutter is set, Fig 83, the shape of the main lever positions the inner release lever so the outer release lever is free to move.

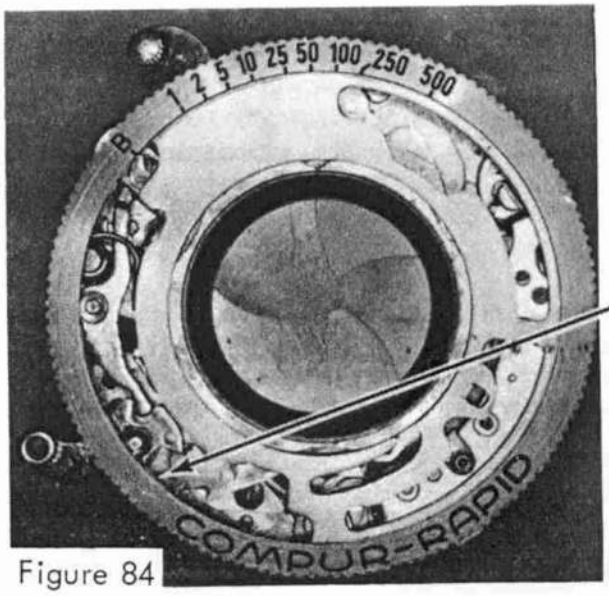


Figure 84

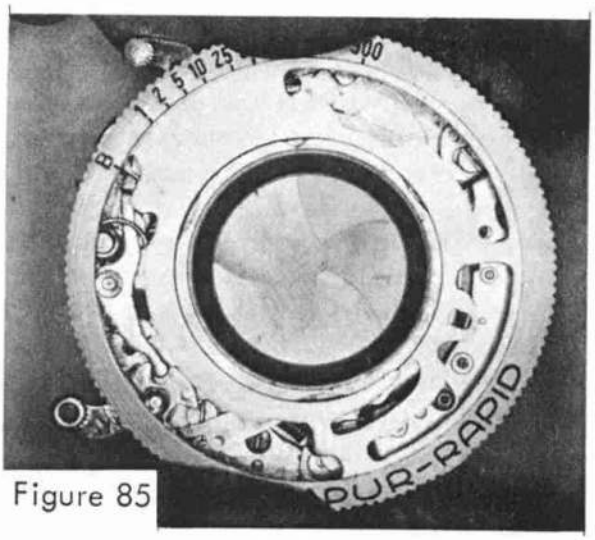


Figure 85

Before proceeding with the next phase of disassembly make sure the shutter is in the released (rest) position. If the diaphragm pointer is a two-part assembly (this varies depending on model) remove the screw attaching the diaphragm pointer to the diaphragm operating ring.

Being careful not to disturb the main lever, rotate the speed cam slightly in both directions as it is worked up off the lens barrel, Fig 85.

CAUTION! DO NOT attempt to set the shutter at this time with the speed cam removed. Orient your shutter once again with the nameplate locking cam cutout positioned at 12 o'clock. Locate and identify the various parts of the shutter which have already been described, Fig. 86.

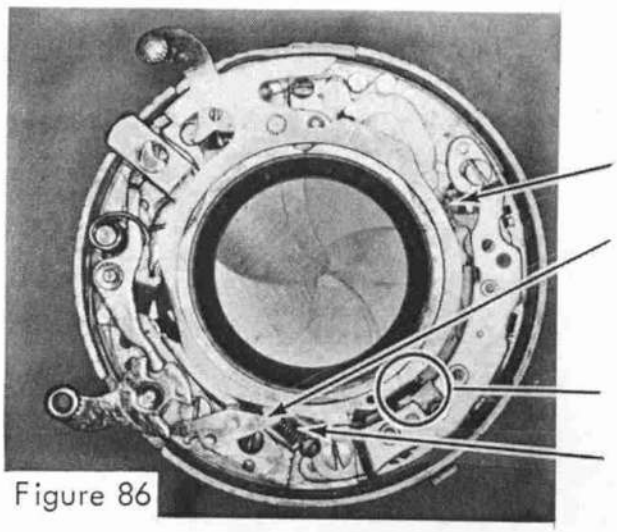


Figure 86

Locate the lug on the main lever which is now in contact with the retard lever. Find the tension-type main spring, part of which can be seen coming from under the main lever and attached to a stud at the end of the gear train at 6 o'clock. Note which parts ride against the main lever -- the retard lever, the pallet lever, and the inner release lever.

Now remove the main lever by lifting the setting lever handle slightly and then allow the tension of the main spring to rotate the main lever counterclockwise until the tension is relieved, Fig 87. Using tweezers, disconnect the main spring from the stud at the end of the gear train, then lift the main lever from around the lens barrel by using a gentle, but firm twisting and lifting motion.

Turn over the main lever assembly and examine the cam follower and the notches and lugs that contact the various parts in the shutter, Fig 88. The milled cam area of the mechanism plate which controls the cam follower movement can also be seen at this time, Fig 89.

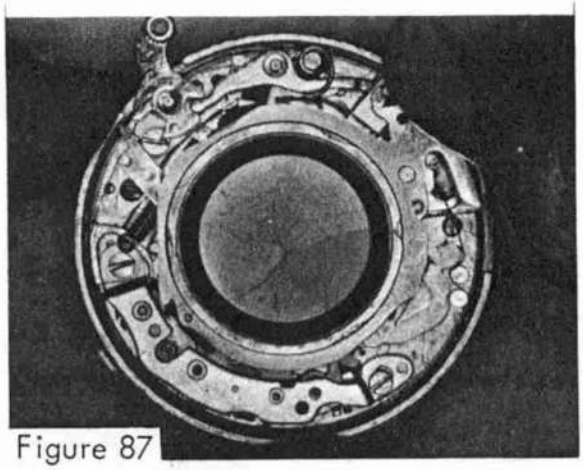


Figure 87

Note:
"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

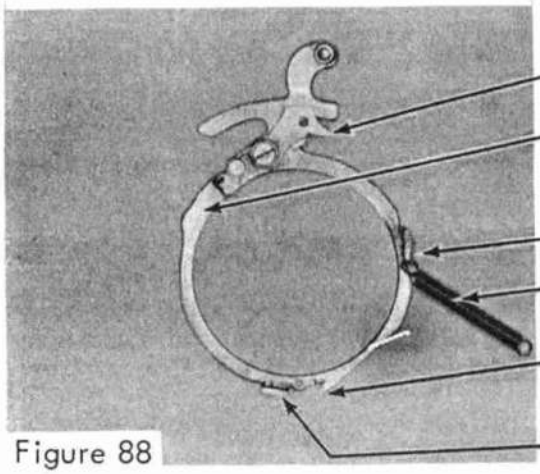


Figure 88

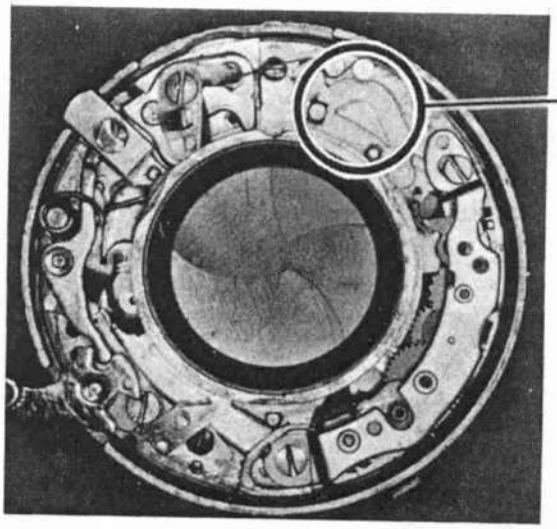


Figure 89

HOW SIMPLE IS COMPLEX?

You can now see what appears to be quite a jumble of mechanism, Fig 90. However, you already know the function of the various parts and disassembly of the Compur shutter is the ultimate in simplicity. You will find it impossible to lose Compur shutter springs because each spring is firmly anchored to the part which it operates.

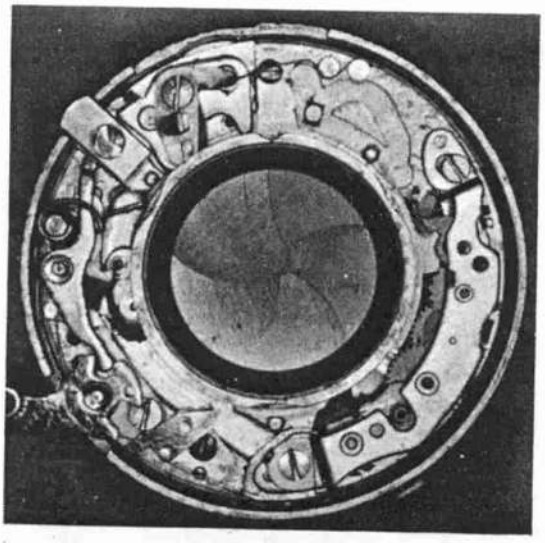


Figure 90

The only caution required is to observe the direction in which springs are engaged and even this is usually obvious.

Depress the release lever and reach through the hole in the cable release socket with a screwdriver to loosen the screw holding

it to the mechanism plate. Using tweezers, lift and slide the cable release socket (with the screw still in place, but unattached to the mechanism plate) from the shutter.

Disassemble the cable release lever by first depressing the release lever. Then gently pry the cable release lever off its post with a small screwdriver placed under the pivot point of the lever, Fig 91.

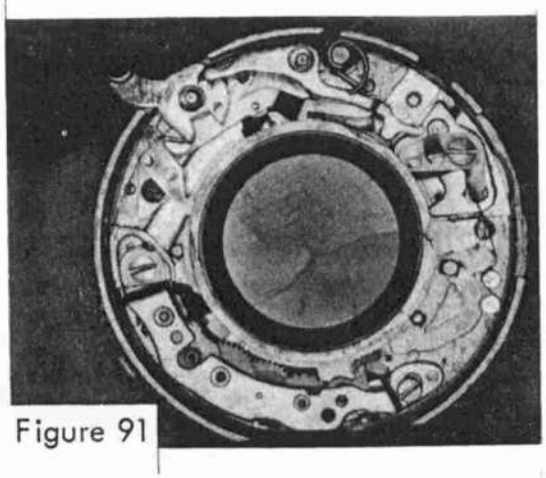


Figure 91

Removing the Cable Release Lever

Note:

"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

Lift the release lever from its post and then note the position of the bulb lever spring, Fig 92. Grasp the spring with your tweezers and gently lift the spring over the cable release lever post and let it rest against the side of the shutter housing. Unscrew the bulb lever screw and remove the screw and the bulb lever with its spring. The inner release lever is held in place by a single screw in its mounting block. The block, inner release lever and spring come out together after removal of the screw.

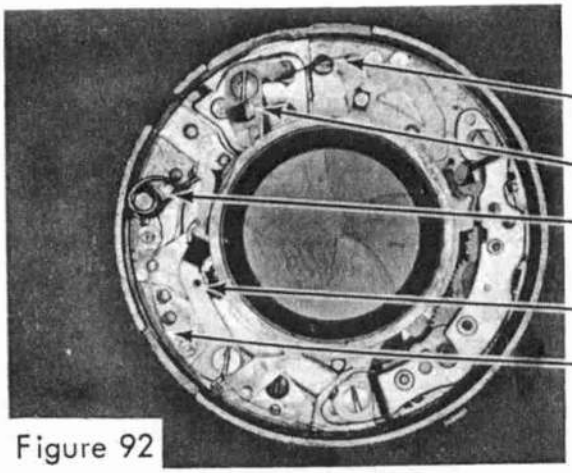


Figure 92

rapid015

On some Compur shutters the bulb lever has no spring of its own and is operated by a dual-purpose spring attached to the inner release lever. This spring operates both the inner release lever and the bulb lever. In these models the inner release lever should be removed first, then the bulb lever.

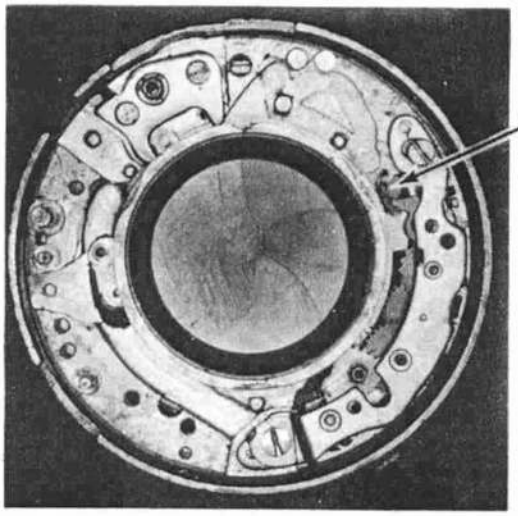


Figure 93

The high-speed spring may now be lifted from its post. Disconnect the leaf lever spring from the leaf lever and unscrew and remove the retaining screw and then the leaf lever. The leaf lever spring will remain attached to the mechanism plate and should not be removed.

The retard section in the Compur shutter is a complete subassembly, held to the mechanism plate by screws at each end. Observe the action of the escapement retard section. It is quite impossible to move the retard lever unless the pallet lever is held back to at least partially disengage the pallet from the star wheel. With the main lever removed from the shutter the pallet lever can move all the way towards the center of the shutter, Fig 93. In this position, the pallet lever engages the pallet so deeply into the star wheel that it cannot rotate and the entire section is locked up. However, the retard lever can be moved by first pushing the pallet lever towards the outside of the shutter, Fig 94. Before removing the retard section from the shutter follow the above procedure, bringing the retard lever towards the outside of the shutter and then releasing the pallet lever, locking the retard in the position shown in figure 95. Then remove the retaining screws, main spring bracket, and the retard assembly from the shutter.

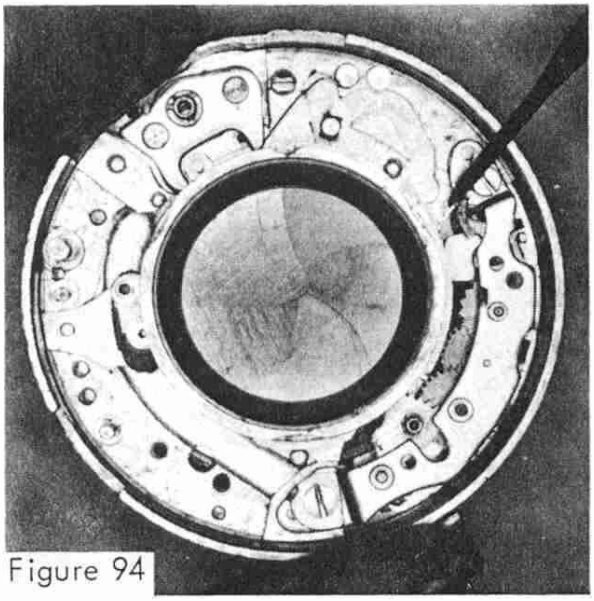
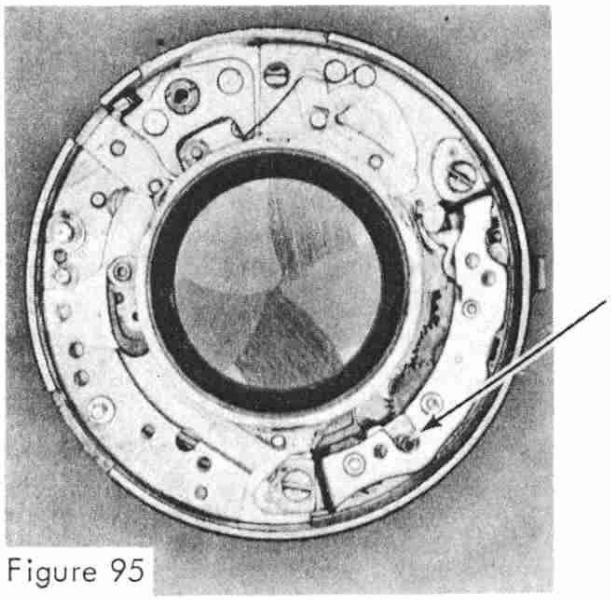


Figure 94



Position of Retard Lever before Removal from Shutter

Figure 95

Using tweezers, move the blade operating ring stud normally operated by the leaf lever until the blades are full open. Then turn the shutter over and remove the three screws holding the mechanism plate, Fig 96. With the shutter still upside down, gently lift the shutter housing from the mechanism plate so as not to disturb the position of the shutter blades.

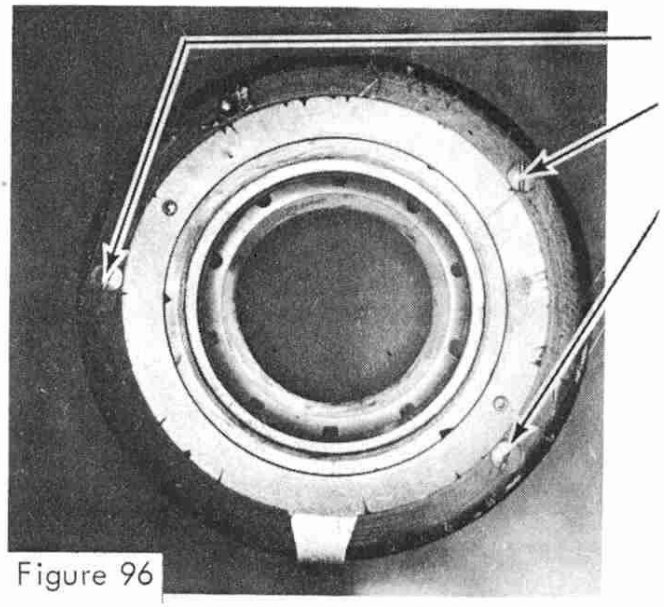
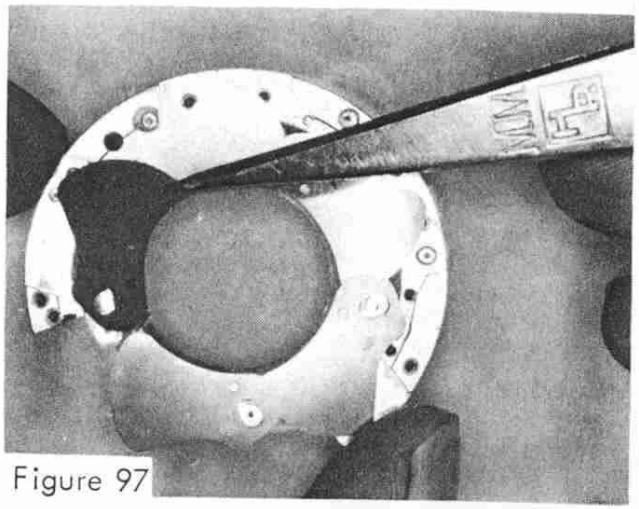


Figure 96

Remove the shutter blades in the usual manner starting with the top blade, Fig. 97.

On models using three instead of five blades, the blades are retained by slotted screws. In other models an extra blade is fitted on the same pins as the first blade and on top of the other blades. Such an extra blade will have three holes instead of the two holes found in the other blades.



Removing the Top (last) Shutter Blade

Figure 97

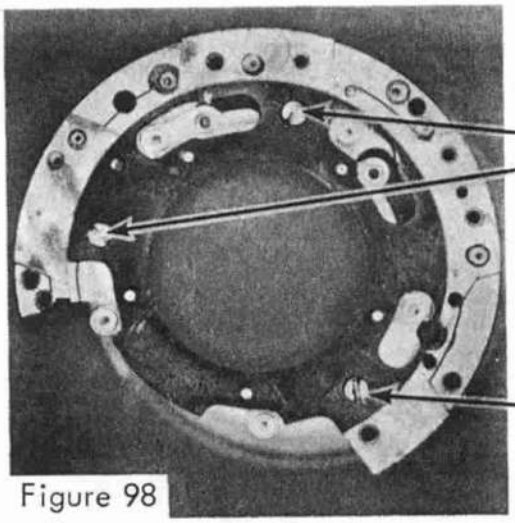


Figure 98

The blade operating ring is held in place by a cover plate which is retained by three screws. One of the three screws is longer than the other two, Fig 98. Some models will use two long screws and one short one. In either case, you should carefully note the position of short screws as they are taken out and then remove the cover plate and blade operating ring, Fig 99.

On the three blade models, the cover plate is not used. The blade operating ring is held in place by two hex-head screws.

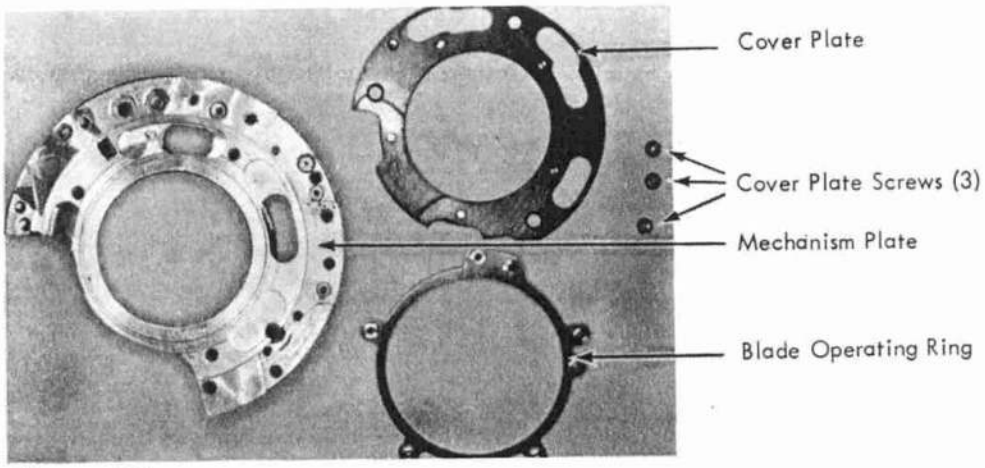


Figure 99

It is not necessary to disassemble the diaphragm at this time, although its disassembly is made in the normal manner. If disassembly is made, record whether the short or long pin goes up, and other differences in the diaphragm wings.

REASSEMBLY OF THE COMPUR-RAPID SHUTTER

Replace the blade operating ring and its cover plate and screws. Make sure the short screws are replaced in the positions noted on disassembly. Install the shutter blades, starting with the first blade on the pins closest to the leaf lever, Fig 100, and working in a clockwise direction.

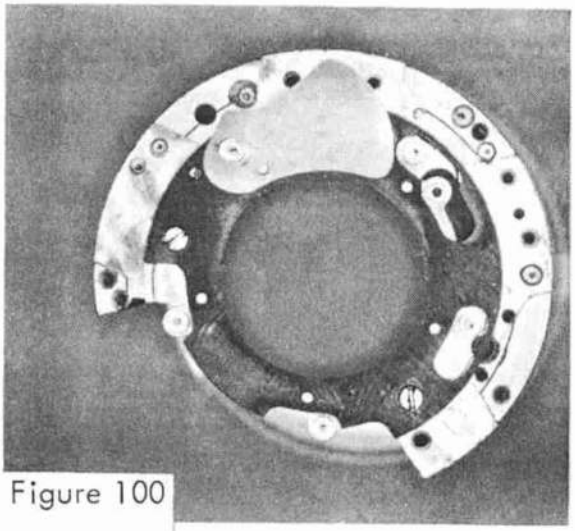


Figure 100

First Blade in Position

Before installing the shutter housing, be sure the mechanism plate is positioned as shown in the preceding illustrations (97-100). This will place the mechanism plate screw holes at approximately 2, 4, and 9 o'clock. Position the shutter housing in the same manner, Fig 101. Holding the housing directly over the mechanism plate, align the screw holes visually and gently lower the housing around the mechanism plate. Replace the three mechanism plate

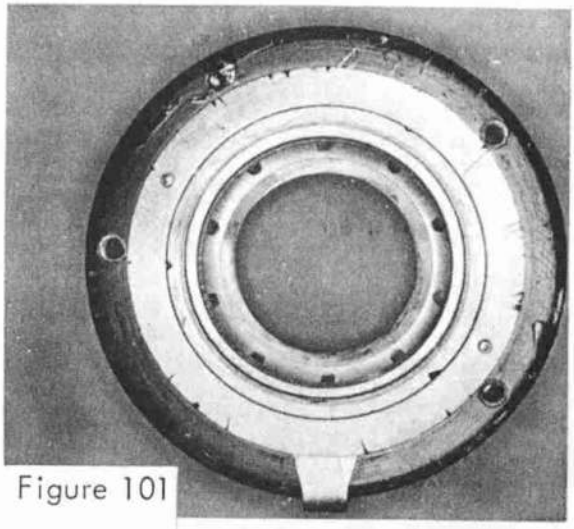


Figure 101

Shutter Housing/Mechanism Plate Screw Holes at 2, 4 and 9 o'clock

screws and test for free movement of the shutter blades by turning the shutter over and operating the blade operating ring with your tweezers.

Install the leaf lever and connect the leaf lever spring. Replace the high-speed spring, inner release and bulb levers in that order. Make sure the long end of the inner release lever spring is against the shutter housing and the end of the bulb lever spring rests on the bottom shoulder of the cable release lever post, Fig 102.

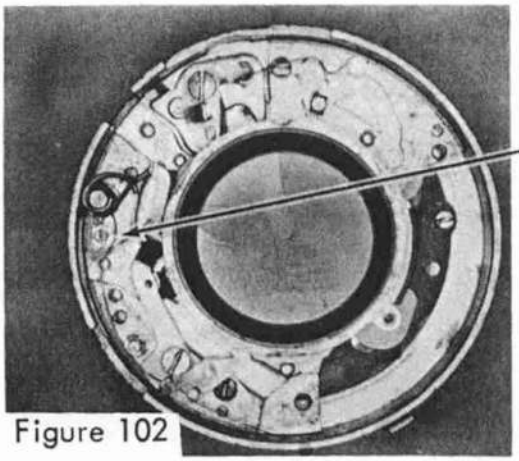


Figure 102

The installation of the cable release lever requires care and practice. Rotate the high-speed spring counterclockwise until the bottom tail of the spring is against the limiting stud on the mechanism plate. Lower the cable release lever into the shutter allowing it to rest in the position shown in figure 103. Then place your finger over the area where the end of the bulb lever comes under and then up against the cable release lever. Keeping your

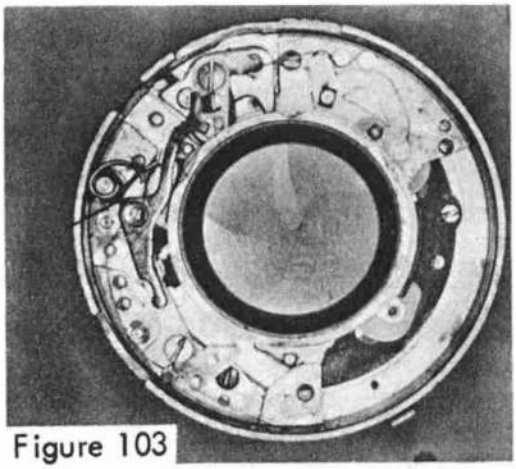


Figure 103

finger pressed against this end of the lever, firmly grasp the other end with your tweezers and pull the lever up and over the cable release lever post, Fig 104. The cable release lever should now

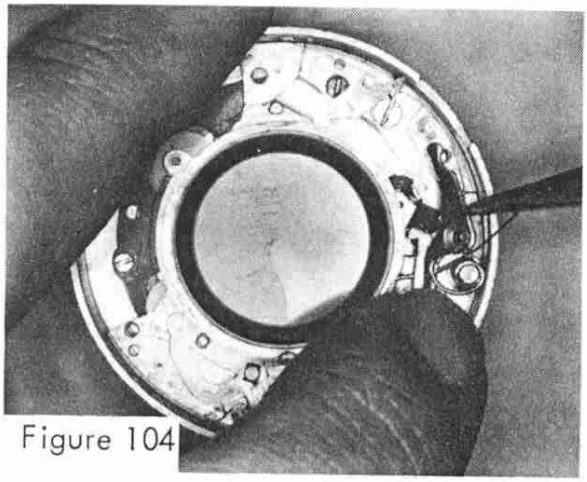


Figure 104

Cable Release Lever Being Brought into Position

Note:

"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

fit at an angle on top of the post. With your finger still pressed against the other end, release your hold with the tweezers and use them as a probe to level out and, at the same time, push the cable release lever down on its post, Fig 105. When the lever is worked all the way down remove your finger and push the end of the cable release lever spring into position against the inside wall of the shutter housing.

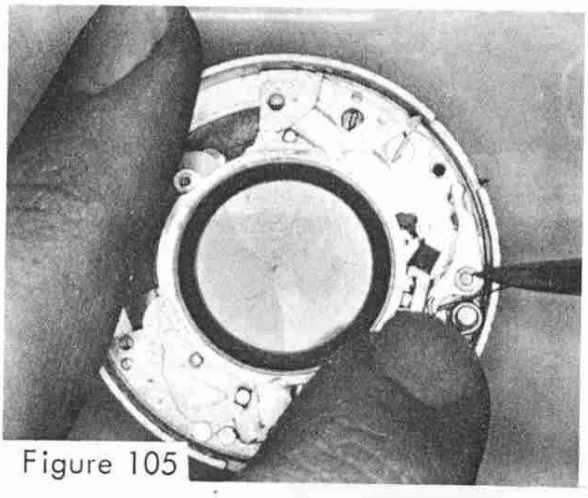


Figure 105

Cable Release Lever Being Pushed Down on Its Post

Note:

"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

Replace the outer release lever and then depress the lever so the cable release socket (and screw) may be slid into position, Fig 106, and tightened down.

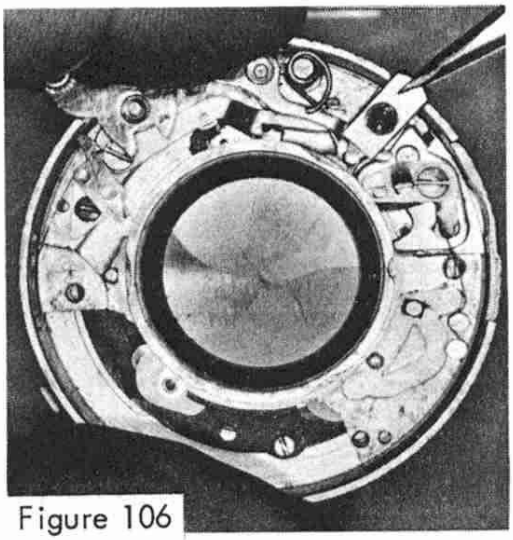


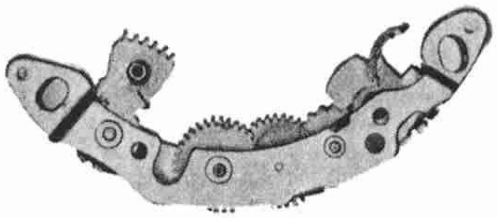
Figure 106

Installation of
Cable Release Socket

Note:

"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

IMPORTANT: If the pallet lever is accidentally depressed while the retard section is out of the shutter, the retard lever may disengage from the first gear, Fig 107. It will then be necessary to retension the hair spring on the second gear as follows:



Retard Lever
Disengaged

Figure 107

Hold the pallet out of engagement and turn the first gear clockwise until the spring unwinds to a diameter slightly larger than that of the first gear, Fig 108. At this point, hold the first gear and engage the retard lever, releasing the first gear as soon as the teeth are well engaged. Continue moving the retard lever until the retard lever stud is against the cutout in the retard cover plate.

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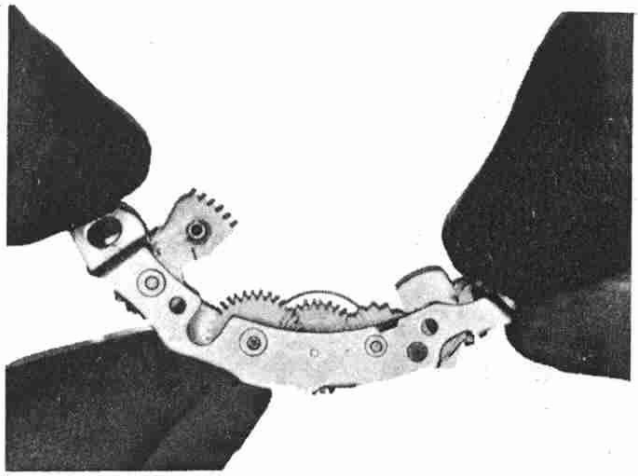
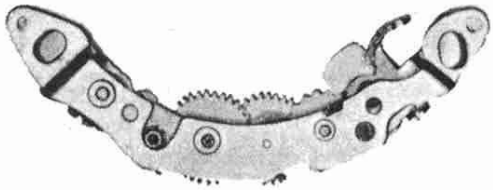


Unwinding the Hair Spring

Figure 108

Then release the pallet lever, locking the retard mechanism in its correct position for installation, Fig 109.



Retard Locked in Proper Position for Installation in Shutter

Figure 109

Now lower the retard mechanism into position on the mechanism plate and replace, but DO NOT tighten, the screw at the pallet end of the retard. Then assemble the main spring bracket and screw at the retard lever end, Fig 110.

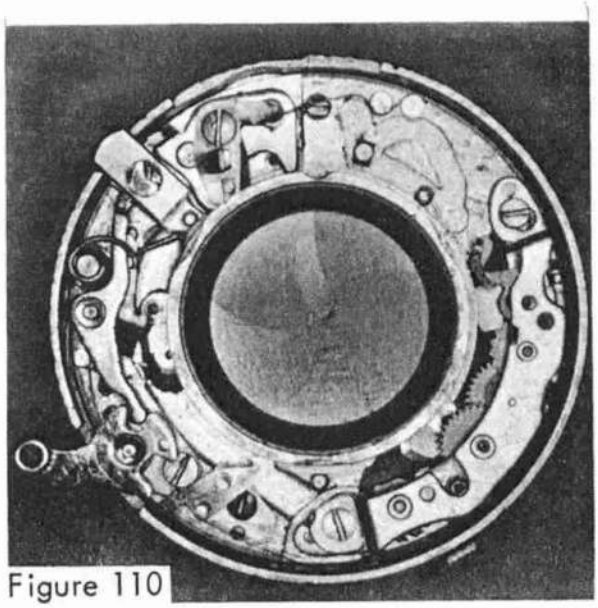


Figure 110

Retard Installed in Shutter

Replacement of the main lever is another installation which first seems awkward, but can be completed easily if performed one step at a time. First, pass the free end of the main spring under the inner release lever as you are lowering the main lever around the lens barrel, Fig 111. Be sure the lug on the main lever to which the main spring is attached is between the bulb lever and the lens barrel while lowering the main lever until it reaches the position

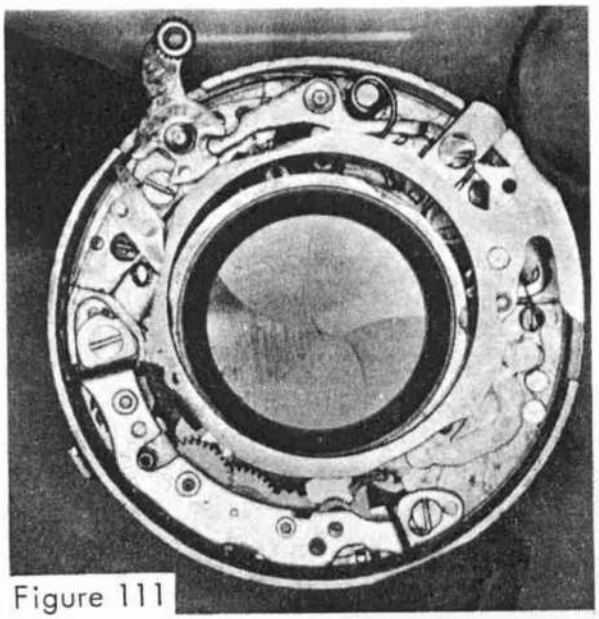


Figure 111

Start of Main Lever Installation with Free End of Main Spring under Inner Release Lever

Note:

"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

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shown in figure 112. The main lever should now be resting on top of the inner release lever and pallet lever. Now connect the free end of the main spring to the bracket at the end of the retard sec-

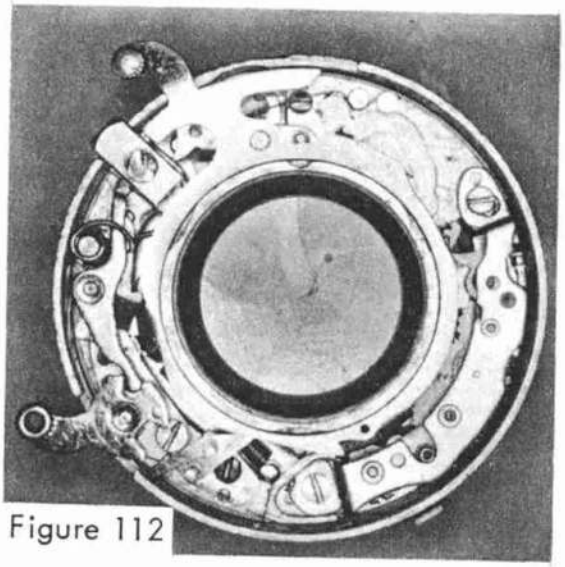

Figure 112

Partial Installation of Main Lever

tion. Be sure that the coils of the spring face downward from the connecting loop of the spring, Fig 113. Hold the main lever down opposite the setting lever and pull the main lever clockwise until it settles down against the main lever stop stud, Fig 114. Still keeping the main lever held down, push the pallet lever towards

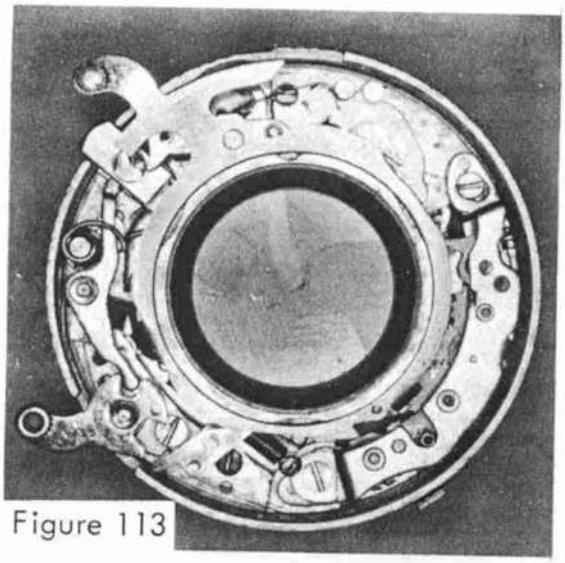

Figure 113

Partial Installation of Main Lever with Main Spring Connected

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the outside of the shutter and the inner release lever towards the lens barrel, Fig 115, so the main lever can settle into its proper position.

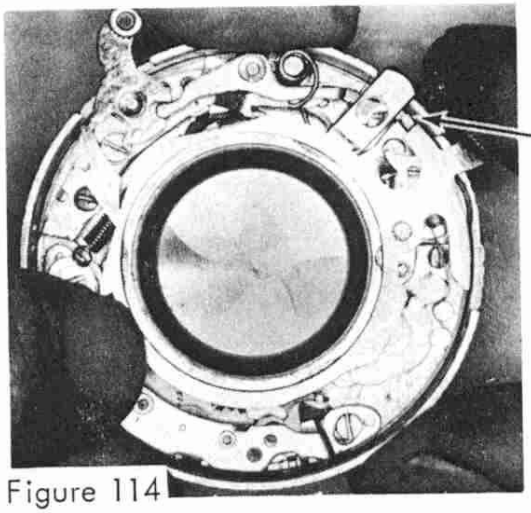

Figure 114

Note:

"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

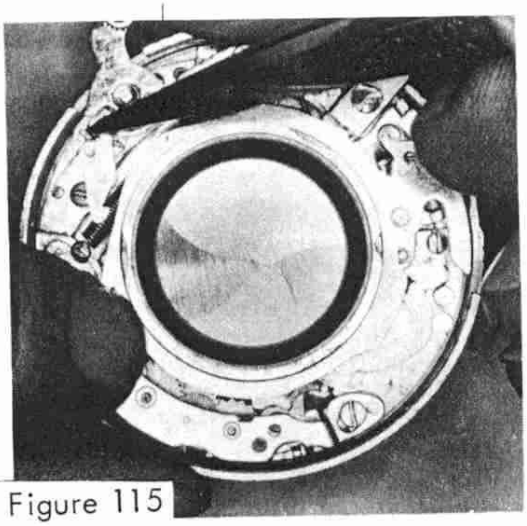

Figure 115

Note:

"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

TIMING OF THE COMPUR-RAPID SHUTTER

The retard section of the shutter should still not be tightened down. While slightly loose the speed timing may be adjusted.

The retard section can be moved to serve two purposes:

1. The stroke of the retard lever at its end of the retard section may be controlled.

2. The amount of engagement of the pallet at the other end of the retard section may be changed.

Move the pallet end of the retard section towards the center of the shutter for less engagement of the pallet, and shorter exposures on the speeds in which the pallet is used (1 to 1/10 sec.). Move the other end of the retard section toward the center of the shutter, to increase the length of the retard lever engagement with the main lever for a longer exposure. Overmovement is possible - a point can be reached where the retard lever will hang up the main lever, preventing complete action of the shutter.

In order to simplify the adjustment of the retard, start with both ends of the retard section all the way toward the center of the shutter, then back the retard lever end off slightly and tighten the screws. Test the adjustment by setting and releasing the shutter, but you must hold the main lever down when operating the shutter in this manner, Fig 116. (On automatic T and B models, the speed cam control stud on the time latch will have to be held towards the outside of the shutter housing when releasing the shutter.) When the shutter is released it should operate smoothly, delivering approximately a one-second exposure. (Allow the release lever

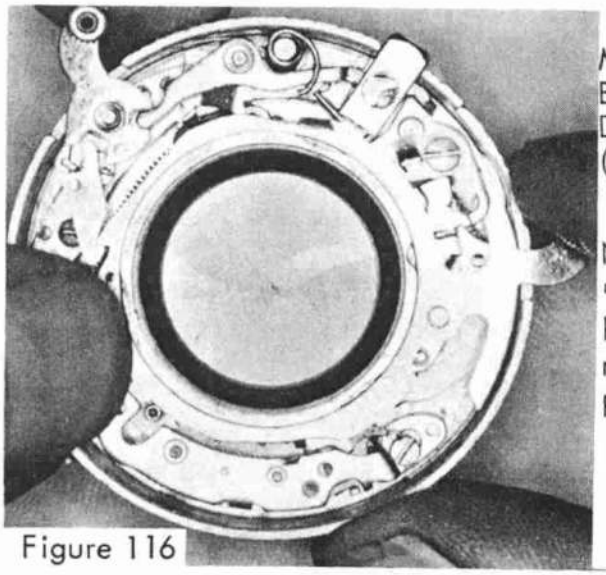

Figure 116

Main Lever
Being Held Down
During Setting
(cocking) Stroke

Note:
"Clock" position of shutter has been changed to ease manipulation of illustrated parts.

to return to its rest position immediately after tripping or the bulb lever can engage the main lever.) If the main lever makes a "popping" sound when it disengages from the retard lever during the setting stroke or if the main lever hangs against the retard lever after being released, the retard lever end is still too close to the center. Loosen the screws and move the retard lever end just a small amount toward the outside of the shutter, tighten the screws and test again.

As soon as smooth action is achieved, replace the speed cam and check the shutter action at the 1/10 second and 1/25 second settings. If the retard section is positioned properly, the 1/10 second setting, Fig 117. will be clearly slower than the 1/25 second setting, Fig 118. If the 1/10 second setting is faster than 1/25 second then the retard lever end was moved too far towards the outside of the shutter and will have to be repositioned.

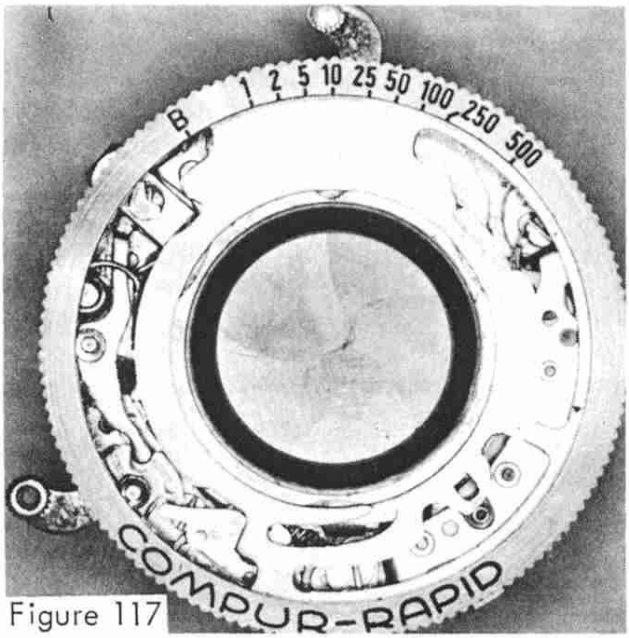

Figure 117

Speed Cam at
1/10 sec. Setting

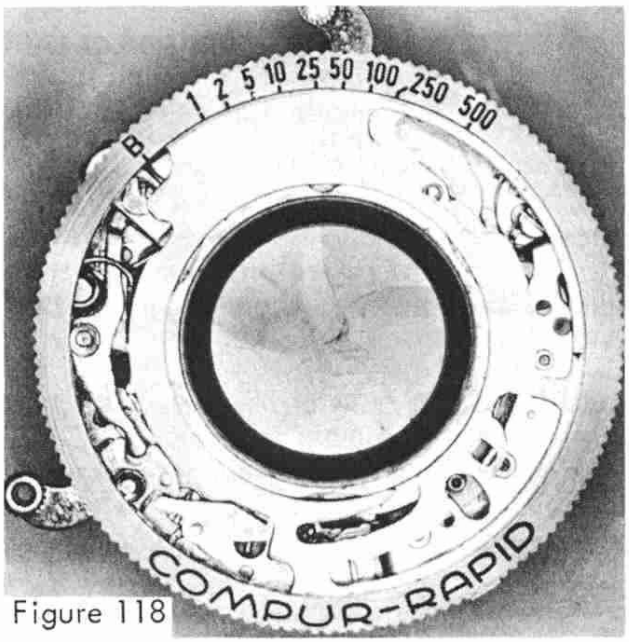

Figure 118

Speed Cam at
1/25 sec. Setting

To complete assembly, fit the lugs on the nameplate into the grooves cut on the outside of the lens barrel and then rotate the nameplate clockwise until the locking cam (or screw hole) is aligned, Fig 119. Turn the locking cam or replace the screw.

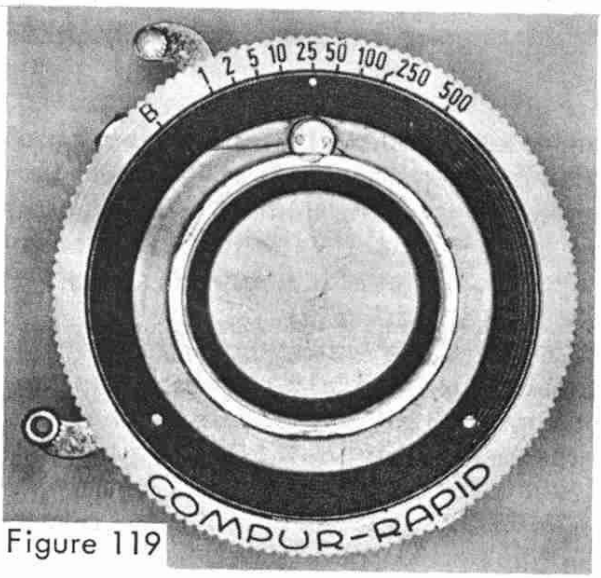

Figure 119

Proper Alignment of Locking Cam before Turning to Locked Position

VARIATIONS IN THE COMPUR RIM-SET SHUTTER

The following variations are self-explanatory and no illustrations will be used. When these models are encountered in your lesson assignments or actual repair practice you should have little difficulty in analyzing the individual actions.

Automatic Time and Bulb Action

On some model Rim-Set Compurs, automatic T and B action is employed. Although the basic design of the main lever, cable release lever, leaf lever and retard section are the same as the Compur-Rapid shutter just covered, the time-bulb action is entirely different. It consists of a bulb lever which is "fork-shaped" and attached to the release lever, a time latch and a deflector.

With the speed cam set on Time and the release lever slight-

ly depressed, a notch on the bulb lever contacts a stud which is a part of the blade operating ring, and full depression of the release lever pushes the blade operating ring stud to open the blades. When the blades are fully open a notch on the time latch drops into place behind the blade operating ring stud and holds the blades in the open position. When the release lever is operated a second time the deflector guides the bulb lever to the left so it may disengage the time latch from the blade operating ring and permit the shutter blades to spring back to the closed position.

There are two projections on the time latch. One contacts the speed cam, and the other one contacts the bulb lever. It is the latter projection that permits the bulb lever to push the time latch out of engagement with the blade operating ring stud.

When the speed cam is set on Bulb, the one projection on the time latch rides up on another step of the speed cam. Operating the release lever now permits the bulb lever to open the blades as it did before, but with the time latch pushed out of the way slightly, it can't engage the blade operating ring stud to hold the blades open, and releasing the release lever will permit the blades to close again, delivering bulb action.

Setting the speed cam on one second (or any other instantaneous speed) places the projection on the time latch against an even higher step on the speed cam. In this position the time latch pushes the bulb lever back enough so that it cannot engage the blade operating ring stud and movement of the release lever will not affect the blades.

The cam follower on this model has an extra stud which contacts the speed cam. When the speed cam is set on time or bulb, the cam follower is held in a position that prohibits movement of the main lever and the shutter cannot be cocked. This allows the free movement of the blade operating ring and release lever for automatic time and bulb action.